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First Genetic Information Replication in Life Origin on Earth

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Why and how our living-bodies, such as human beings, have been originated from a barely non-life planet into the highly-intelligent life existing Earth have been interested and pursued by large population of readers and investigators. Apart from evolution of Darwin's arguments, [1]some detailed evolutionary theories and steps have been stated and discussed by modern evolutionists and investigators, including the evolutionary step of first genetic information duplication. There has been DNA-, RNA- and protein-originated evolution hypotheses regarding the first genetic information having been duplicated and translated. There were lot of experimental data can be used to support two possibilities of genetic material duplication. For example, we simulate genetic information duplication in the presence of one type of genetic materials. But this likes "chicken-or-the-egg" dilemma concerning which genetic polymer comes first and we cannot tell which is true [2]. Since genetic information duplication is the foremost important step to copy a life with integrity and persistency, it is widely accepted that this process is a crucial step in evolution progression for life creation. In this article, we try to overview these hypotheses and discuss one of the crucial factors for evolution, formation rate or turn-over speeds of different genetic materials (DNA, RNA and protein), to further suggest an important role RNA may take in life origin on Earth. Also, we try to discuss one of strategies of justifying these hypothesis and theory of whether through DNA, RNA, or protein-based life-evolution by using simulating system of different "prehistoric broths" and discover their relations by simulated calculations.

Most of us now agree life is transformed from a world of very few types of simplest inorganic materials to nowadays tremendously diversified biomolecular world [3,4]. These evolutions, we generally agree, are phase-wise, and undergo evolution step-by-step. In the initial step, materials on the Earth may transform from inorganic materials into organic molecules containing mixtures that are now called "a prebiotic broth" [3-5]. Then the Earth comes to an important stage of genetic reproductions from these "prebiotic broths" into a genetic informational reproducible stage. This article stresses and discusses a genetic information duplicative stage of evolutionary process. In this stage, three genetic materials DNA, [6] RNA, [7-9] and/or peptide, [10-12] have all been proposed to be the initial materials of providing this transformation. DNA, as the presently dominant genetic information carrier, [5] has been challenged by other two hypotheses of RNA or peptide origin arguments [7-12]. However, at present no concrete evidence and explanation could reach general agreements to support one of these three hypotheses. The dilemma persists until nowadays. Since both RNA and protein (peptide) can duplicate themselves, two strings of arguments occur (RNA- or protein-original world).

Problems presenting and discussion

Present findings and arguments supporting each form of life-evolution theory are relied on experimental data and/or natural clues linking with the possibility of individual genetic information duplication amongst DNA, RNA and peptide [6-12]. There were lots of experimental data that can be used to support two possibilities of genetic material duplication. For example, we simulate genetic information duplication in the presence of one type of genetic materials. But this is like "chicken-or-the-egg" dilemma concerning which genetic polymer comes first and we cannot tell which is true [2]. From the choice of these three genetic duplicating systems, it seems a stalemate to pursue according to current way of thinking. Some key-processes such as the matter of speed and stability from a new perspective angle can be used to analyze of this process.

Since we presently cannot root out any possibilities of genetic materials, such as pro-DNA, pro-RNA or protein as an origin of life, may we hypothesize that there might be pro-DNA, pro-RNA and pro-peptide polymers coexistence in prebiotic broths at the stage of early genetic information duplication. So there is no such question of which single genetic material can fulfill this process. However, these polymers cooperatively and competitively reproduce genetic information. We have this hypothesis by finding many reports that materials promoting genetic replication such as ribosome are a mixture of RNA and proteins [11] and we think the genetic information duplication is a complex process and might be fulfilled by more than one type of materials. From modern knowledge, the synthesis of RNA is much quicker and easier than the synthesis of DNA and protein. If we deduce from this base, we hypothesize that the turnover rate of RNA is quicker than that of DNA or protein. Considering the quickest producing characteristics of RNA, the unstable and short generation times of RNA make them the fittest vehicle of normal mutations for evolutionary reasons. Not only can RNA be genetically copied into either DNA or peptide, but the shortest generation time of RNA make them the competitive advantageous than DNA and peptide to play workable roles in evolution of genetic systems on the Earth. Until now, RNA family represents the largest varieties of sources of genetic materials in the sea of the Earth nowadays which is most similarity with the conditions of prehistoric times [13]. So, according to our perspective, although RNA is the mostly well-regarded original informational carrier in the secondary evolutionary stages (genetic information originating stage) of life on Earth among all three genetic-carrying materials, presently no existing experimental approach has been used to verify this difference of genetic information copying and mutations. According to the golden law of evolution given by Charles Darwin—survival of the fittest, the fastest duplicative speed of RNA may be a driving-force for important role of RNA may take in life-origin.

Conclusion and Future Direction

So, according to our deduction, among all three genetic-carrying materials presently existing, RNA, owing to its characteristics of competitively advantages, might be mostly possibly as a media of initial genetic information reproducible in the life-origin on Earth. We herein favor the RNA hypotheses more than the other two categories

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of hypotheses when regarding to the conditions and environments of prehistoric times.

Now, we begin to believe that all three genetic materials can all be present at the era of genetic information duplication. We made this conclusion by finding many reports that materials promoting genetic replication such as ribosome are a mixture of RNA and proteins [11]. It is possible two or three genetic materials cooperatively duplicate their information right at its beginning. So it might be needless to divide RNA world or alternative RNA world.

With a new trend of using mathematic models to analyzing or solving the important problems of biology worldwide, [14-16] we here provide a proposal to solve these problems by using systems biology approaches. By building simulating conditions of "prebiotic broth" to decide rate of copying or mutation of different genetic information reproduction spans (DNA, RNA or peptide) throughout the definite time-scale and decide if rate factor can decide the process of genetic information duplication. Also we can data back the prehistoric rocks of different epics for organic compounds remnants, especially genetic materials by the analysis of isotope abundance), compare the calculate these data for coming up a correct and helpful verdictions of this long-standing scientific dilemma and controversy and/or organize some well-organized competitions among world algorithmic research groups and practicing institutions at different levels [17].

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